

REMARKS

1. Amendments to the Drawings

In the Office action, new corrected drawings in compliance with 37 CFR § 1.121(d) were required. To that end, the Applicants have attached sheets of drawings which include Figs. 1A and 1B; 2A-2E; 3; 4; 5; 6A and 6B; 7; 8; 9; 10; 11A and 11B; 12; 13A-13C; and 14A-14C that correct various informalities and replace the original sheets including Figs. 1A and 1B; 2A-2E; 3; 4; 5; 6A and 6B; 7; 8; 9; 10; 11A and 11B; 12; 13A-13C; and 14A-14C.

2. Double Patenting

In the Office action, claims 1-21 were rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-190 of copending United States patent application 09/907,512. Applicants respectfully submit an amendment to United States patent application 09/907,512, filed on or about June 3, 2004 with the United States Patent and Trademark Office, attached hereto as EXHIBIT A, indicating that claims 1-190 of United States patent application number 09/907,512 have been cancelled and replaced by claims 191-216. To that end, the Applicants respectfully contend that claims 191-216 of United States patent application 09/907,512 do not render claims 1-21 of the present patent application obvious.

Claims 1, 10, and 17, as amended, define a method to control a relative position between a surface and a body to form a pattern in the surface, the pattern comprising a plurality of protrusions and recessions, the method

including, *inter alia*, moving the body to obtain a desired spatial relationship between the surface and the body while minimizing undesirable dimensional variations between the surface and the plurality of protrusions and the surface and the plurality of recessions.

Claims 191-216 of United States patent application 09/907,512 are completely silent with respect to minimizing undesirable dimensional variations between a surface and a plurality of protrusions and a surface and a plurality of recessions. Rather, claims 191-216 of United States patent application 09/907,512 are directed towards attenuating resistance to movement between a template and a substrate. Claims 191-216 of United States patent application 09/907,512 achieve the same by establishing a distance between the template and the substrate based on a viscosity of a material disposed therebetween. Claims 191-216 of United States patent application 09/907,512 have no mention of dimensional variations between a surface and a plurality of protrusions and a surface and a plurality of recessions, much less minimizing the dimensional variations. Thus, claims 191-216 of United States patent application 09/907,512 are not directed towards minimizing undesirable dimensional variations between a surface and a plurality of protrusions and a surface and a plurality of recessions. Therefore, the Applicants respectfully contend that claims 191-216 of United States patent application 09/907,512 do not render claims 1-21 of the present patent application obvious.

Appl. No. 10/785,248
Atty. Dkt. No. PA132-08D09

Applicants respectfully request examination in view of the remarks. A notice of allowance is earnestly solicited.

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to the Commissioner for Patents.

Signed: Katrina Prati
Typed Name: Katrina Prati

Date: 12-3-04

Respectfully Submitted,



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IN THE DRAWINGS:

The attached sheets of drawings which include Figs. 1A and 1B; 2A-2E; 3; 4; 5; 6A and 6B; 7; 8; 9; 10; 11A and 11B; 12; 13A-13C; and 14A-14C correct various informalities and replace the original sheets including Figs. 1A and 1B; 2A-2E; 3; 4; 5; 6A and 6B; 7; 8; 9; 10; 11A and 11B; 12; 13A-13C; and 14A-14C.

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JUN 03 2004

**OFFICIAL**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Applicants: Sreenivasan et al. PATENT APPLICATION
Serial No.: 09/907,512 Group Art Unit: 1756
Filed: July 16, 2001 Examiner: Young, Christopher G.
For: HIGH-RESOLUTION OVERLAY ALIGNMENT METHODS AND SYSTEMS
FOR IMPRINT LITHOGRAPHY

AMENDMENT AFTER NOTICE OF ALLOWANCE

Commissioner
for Patents
Alexandria, VA 22313

Sir:

In response to the Notice of Allowance mailed April
30, 2004, please amend the application as follows:

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EXHIBIT A

IN THE SPECIFICATION:

Following paragraph [0001], please insert the following paragraph.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR
DEVELOPMENT

The U.S. Government has a paid-up license in this invention and the right in limited circumstances to require the patent owner to license others on reasonable terms as provided for by the terms of N66001-98-1-8914 awarded by the Defense Advanced Research Projects Agency (DARPA).

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IN THE CLAIMS:

191. (Currently Amended) A method of aligning a substrate with a patterned template spaced-apart from said substrate with a liquid material disposed therebetween, said substrate having substrate alignment marks disposed thereon and said patterned template having template alignment marks formed thereon, said method comprising:

adjusting a distance between said patterned template and said substrate such that said material contacts both said patterned template and said substrate, defining a contact region; and

varying an overlay placement of said patterned template with respect to said substrate such that said template alignment marks and said substrate alignment marks are substantially aligned, with said distance being established, based upon a viscosity associated with said material, to attenuate resistance to movement between said patterned template and said substrate due to properties of said material.

192. (Previously Presented) The method as recited in claim 191 wherein adjusting said distance further includes contacting both said pattern template and said substrate with said liquid while maintaining said template alignment marks and said substrate alignment marks outside of said contact region.

193. (Previously Presented) The method as recited in claim 192 further including, after varying said overlay placement, reducing said distance to expand said contact

region to be in superimposition with both said template alignment marks and said substrate alignment marks.

194. (Previously Presented) The method as recited in claim 191 wherein adjusting said distance further includes contacting said material to be in superimposition with both said template alignment marks and said substrate alignment marks before varying said overlay placement.

195. (Previously Presented) The method as recited in claim 191 further including recording multiple patterns in separately dispensed regions of said material, with a subset of said multiple patterns being positioned in differing portions of said material and obtaining a desired alignment between said patterned template and each of said differing portions by repeating adjusting said distance and varying said overlay placement of said patterned template with respect to said substrate at each of said differing portions such that said template alignment marks and said substrate alignment marks are substantially aligned.

196. (Previously Presented) The method as recited in claim 191 further including recording multiple patterns in said material, with a subset of said multiple patterns being positioned in differing portions of said material and obtaining a desired alignment between said patterned template and each of said differing portions by repeating adjusting said distance and varying said overlay placement of said patterned template with respect to said substrate at a subset of said differing portions, defining initial alignment portions, with the remaining portions of said differing portions forming an additional subset, and

determining alignment between said patterned template and said substrate at the portions associated with said additional subset as a function of a measurement of relative movement between said patterned template and said substrate measured from said initial alignment portions.

197. (Previously Presented) The method of claim 191 wherein varying said overlay placement further includes determining said alignment between said patterned template and said substrate by applying a first wavelength of light through said patterned template, wherein said first wavelength of light causes said substrate alignment marks to be in focus and said template alignment marks to be out of focus with respect to an analysis tool; and applying a second wavelength of light through said patterned template, wherein said second wavelength of light causes said template alignment marks to be in focus and said substrate alignment marks to be out of focus with respect to said analysis tool.

198. (Previously Presented) The method as recited in claim 191 further including recording a pattern in said material by impinging a curing light upon said material to substantially cure said material, defining cured material, and separating said patterned template from said cured material.

199. (Previously Presented) The method of claim 191 wherein varying said overlay placement further includes determining said alignment between said patterned template and said substrate by providing a polarizing light alignment tool and a polarizing filter system, with said

polarizing filter system being disposed between said polarizing light alignment tool and said patterned template, wherein said polarizing filter system comprises a first polarizing filter substantially oriented over said substrate alignment marks and a second polarizing filter substantially oriented over said template alignment marks, wherein said polarization of light capable of passing through said first polarization filter is substantially different than said polarization of light capable of passing through said second polarization filter.

200. (Previously Presented) The method of claim 191 further including providing said template alignment marks and said substrate alignment marks with symmetric geometric shapes, wherein varying said overlay placement further includes determining an alignment between said patterned template and said substrate by determining centers of said substrate and said template alignment marks, and comparing a location of the center of said template alignment marks to a location of the center of said substrate alignment marks.

201. (Previously Presented) The method as recited in claim 191 further including recording multiple patterns in separately dispensed regions of said material, with a subset of said multiple patterns being positioned in differing portions of said material and obtaining a desired alignment between said patterned template and each of said differing portions by repeating adjusting said distance and varying said overlay placement of said patterned template with respect to said substrate at each of said differing

portions such that said template alignment marks and said substrate alignment marks are substantially aligned.

202. (Currently Amended) A method of aligning a substrate with a patterned template spaced-apart from said substrate with a liquid material disposed therebetween, said substrate having substrate alignment marks disposed thereon and said patterned template having template alignment marks formed thereon, said method comprising:

adjusting a distance between said patterned template and said substrate such that said material contacts both said patterned template and said substrate, defining a contact region;

varying an overlay placement of said patterned template with respect to said substrate such that said template alignment marks and said substrate alignment marks are substantially aligned by adjustment of said overlay placement through altering dimensions of said patterned template, with said distance being established, based upon a viscosity associated with said material, to attenuate resistance to movement between said patterned template and said substrate due to properties of said material, with said properties including stiction; and

recording multiple patterns in separately dispensed regions of said material, with a subset of said multiple patterns being positioned in differing portions of said material and obtaining a desired alignment between said patterned template and each of said differing portions

203. (Previously Presented) The method as recited in claim 202 wherein recording multiple patterns further includes obtaining a desired alignment between said

patterned template and each of said differing portions by repeating adjusting said distance and varying said overlay placement of said patterned template with respect to said substrate at each of said differing portions such that said template alignment marks and said substrate alignment marks are substantially aligned.

204. (Previously Presented) The method as recited in claim 202 wherein recording multiple patterns further includes obtaining a desired alignment between said patterned template and each of said differing portions by repeating adjusting said distance and varying said overlay placement of said patterned template with respect to said substrate at a subset of said differing portions, defining initial alignment portions, with the remaining portions of said differing portions forming an additional subset, and determining alignment between said patterned template and said substrate at the portions associated with said additional subset as a function of a measurement of relative movement between said patterned template and said substrate measured from said initial alignment portions.

205. (Previously Presented) The method of claim 202 wherein altering dimensions further includes applying a compressive force to at least a portion of said patterned template.

206. (Previously Presented) The method of claim 202 wherein adjusting said overlay placement further includes altering dimensions of said patterned template by altering a temperature of said patterned template.

207. (Previously Presented) The method of claim 202 wherein adjusting said overlay placement further includes altering dimensions of said patterned template by applying an elongating force to at least a portion of said patterned template.

208. (Previously Presented) The method of claim 202 wherein varying said overlay placement further includes determining said alignment between said patterned template and said substrate by applying a first wavelength of light through said patterned template, wherein said first wavelength of light causes said substrate alignment marks to be in focus and said template alignment marks to be out of focus with respect to an analysis tool; and applying a second wavelength of light through said patterned template, wherein said second wavelength of light causes said template alignment marks to be in focus and said substrate alignment marks to be out of focus with respect to said analysis tool.

209. (Previously Presented) The method of claim 202 wherein varying said overlay placement further includes determining said alignment between said patterned template and said substrate by providing a polarizing light alignment tool and a polarizing filter system, with said polarizing filter system being disposed between said polarizing light alignment tool and said patterned template, wherein said polarizing filter system comprises a first polarizing filter substantially oriented over said substrate alignment marks and a second polarizing filter substantially oriented over said template alignment marks, wherein said polarization of light capable of passing

through said first polarization filter is substantially different than said polarization of light capable of passing through said second polarization filter.

210. (Currently Amended) A method of aligning a substrate with a patterned template spaced-apart from said substrate with a liquid material disposed therebetween, said substrate having substrate alignment marks disposed thereon and said patterned template having template alignment marks formed thereon, said method comprising:

adjusting a distance between said patterned template and said substrate such that said material contacts both said patterned template and said substrate, defining a contact region; and

varying an overlay placement of said patterned template with respect to said substrate such that said template alignment marks and said substrate alignment marks are substantially aligned by employing first and second fluxes of light, each of which has differing characteristics associated therewith, defining first and second characteristics, with said substrate alignment marks and said template alignment marks being responsive to said first characteristics, and defining a first response, and responsive to said second characteristics, defining a second response differing from said first response, with said distance being established, based upon a viscosity associated with said material, to attenuate resistance to movement between said patterned template and said substrate due to properties of said material, with said properties including stiction.

211. (Previously Presented) The method as recited in claim 210 further including recording multiple patterns in separately dispensed regions of said material, with a subset of said multiple patterns being positioned in differing portions of said material and obtaining a desired alignment between said patterned template and each of said differing portions by repeating adjusting said distance and varying said overlay placement of said patterned template with respect to said substrate at each of said differing portions such that said template alignment marks and said substrate alignment marks are substantially aligned.

212. (Previously Presented) The method of claim 210 further including providing an analysis tool in optical communication with said substrate alignment marks and said template alignment marks wherein said varying said overlay placement further includes associating said first flux of light with said first characteristic being a first wavelength, with said first response including said substrate alignment marks being in-focus and said template alignment marks to be out-of-focus with respect to said analysis tool; and associating said second flux of light with said second characteristic being a second wavelength of light, with said second response including said template alignment marks being in-focus and said substrate alignment marks to being out-of-focus with respect to said analysis tool.

213. (Previously Presented) The method of claim 210 further including providing an analysis tool in optical communication with said substrate alignment marks and said template alignment marks wherein varying said overlay

placement further associating with said first wavelength of light said first characteristics being a first polarization with said first response including said substrate alignment marks being sensed by said analysis tool and said analysis tool being precluded from sensing said template alignment marks; and associating with said second flux of light said second characteristic being a second polarization, with said second response including said template alignment marks being sensed by said analysis tool and said analysis tool being precluded from sensing said substrate alignment marks.

214. (Previously Presented) The method of claim 210 wherein varying said overlay placement further includes determining said alignment marks between said patterned template and said substrate by applying said first and second flux of light to said patterned template, wherein said patterned template is composed of a first material and wherein said alignment marks are formed by depositing a second material, different from said first material, upon said patterned template, wherein said first and second materials are substantially transparent to a wavelength of a third flux of light used to cure said liquid material, and wherein said second material produces an analyzable mark with substantial contrast when said first and second flux of light is applied to said patterned template.

215. (Previously Presented) The method as recited in claim 191 wherein said properties include stiction.

216. (Previously Presented) A method of aligning a substrate with a patterned template spaced-apart from said

substrate with a liquid material disposed therebetween, said substrate having substrate alignment marks disposed thereon and said patterned template having template alignment marks formed thereon, said method comprising:

adjusting a distance between said patterned template and said substrate such that said material contacts both said patterned template and said substrate, defining a contact region; and

varying an overlay placement of said patterned template with respect to said substrate such that said template alignment marks and said substrate alignment marks are substantially aligned.

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REMARKS1. Amendments to the Specification

To comport with the requirements of 35 U.S.C. § 202(c)(6), the written specification has been amended. Specifically, the specification has been amended to state that the U.S. Government has a paid-up license in this invention and the right in limited circumstances to require the patent owner to license others on reasonable terms as provided for by the terms of N66001-98-1-8914 awarded by the Defense Advanced Research Projects Agency (DARPA). No new matter has been introduced by the amendments.

2. Amendments to the Claims

Applicants have amended the claims to more clearly define the invention. Specifically, claims 191, 202, and 210 have been amended to more clearly state that the movement is between the patterned template and the substrate. None of the amendments to the claims were necessitated to overcome any prior art and no new matter has been introduced by... these amendments.

Applicants respectfully request that the present amendment be entered and the application proceeds to issuance in due course incorporating the present amendment.

CERTIFICATE OF TRANSMISSION
I hereby certify that this
correspondence is being facsimile
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and Trademark Office, Group Art
Unit No. 1756 (FAX No. (703) 872-
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